

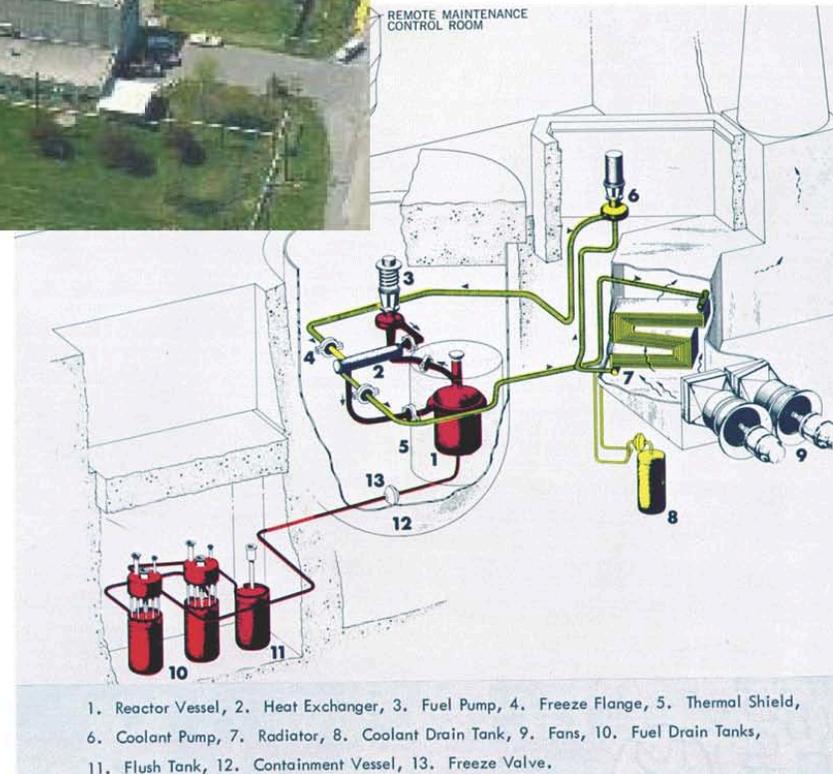
Nuclear Energy University Program (NEUP) Fiscal Year 2020 Annual Planning Webinar Molten Salt Reactor (Subtopic IRP-RC-1)

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Molten Salt Reactor Experiment (MSRE)

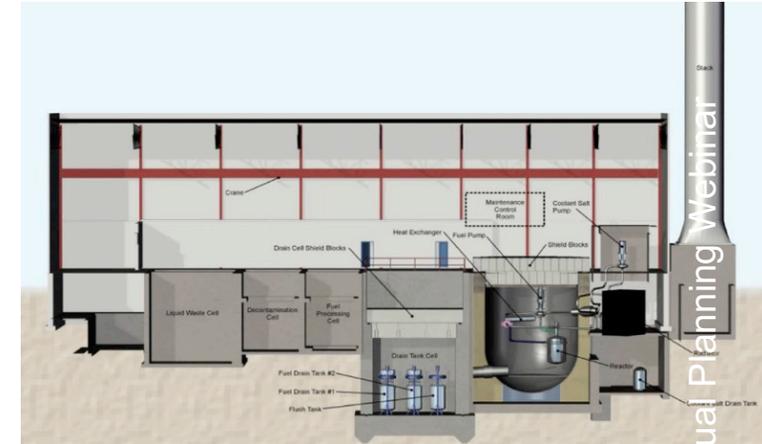
HISTORY

Operated at Oak Ridge National Laboratory from 1965 to 1969, is the Primary Reactor-Based Experience with Molten Salts



Molten Salt Reactor Experiment (MSRE)

- **Fuel (^{235}U , ^{233}U and ^{239}Pu) dissolved in a fluoride salt**
 - Liquid-fuel reactor
 - Thermal-spectrum limited breeder reactor
 - 7.34 MW
 - 1225°F (662 C) outlet temperature
 - Fuel salt was 65% Li_7F - 29.1% BeF_2 - 5% ZrF_4 - 0.9% UF_4
 - Program cancelled when the liquid metal fast breeder reactor chosen
- **New interest in MSR**
 - Fast spectrum or thermal spectrum
 - Liquid fuel or solid fuel
 - Target diverse markets – base load electricity generation, process heat applications, desalination, water purification, remote locations



IRP-RC-1: INFRASTRUCTURE TO SUPPORT MOLTEN SALT REACTORS

- **Proposals are requested to develop and enhance domestic university capabilities to generate high-quality data, in coordination with the DOE MSR Campaign and MSR developers**
 - Emphasis should include the establishment of new or enhanced research infrastructure at universities to broaden the base capability, to provide high-quality data for model validation or material property performance and prepare students to enter the emerging advanced reactor technical field
 - The development and/or expansion of university, industry and national laboratories irradiation facilities is strongly encouraged
 - Infrastructure support could include but are not limited to salt production, characterization and property measurement, and isotope production and isolation

IRP-RC-1: INFRASTRUCTURE TO SUPPORT MOLTEN SALT REACTORS

EXAMPLES

- **To ensure proposed infrastructure efforts complement existing research, specific examples are provided below. In addition to these examples, other proposals enhancing the domestic MSR research infrastructure are welcome**
 - Experimental Validation of Thermal Hydraulic Simulations
 - *MSR code validation with appropriately scaled fundamental, SET, or MET experiments that complement those that have been, or can be, conducted at suitable, existing integral facilities.*
 - Advanced Heat Exchangers
 - Experimental Data for Fission Product Retention, Diffusion and Transport Properties
 - *Study the release and transport behavior of radionuclides (gaseous, mists, foams) in liquid-fueled molten salt reactors under representative irradiation conditions.*
 - Targeted Irradiations of Core Internal and Boundary Materials
 - *understand radiation damage effects (swelling, embrittlement, segregation, etc.) on advanced structural materials for representative molten salt reactors and also for candidate non-metal reactor core structural material, such as graphite or silicon carbide.*

Points of Contact for IRP-RC-1 Molten Salt Reactor

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